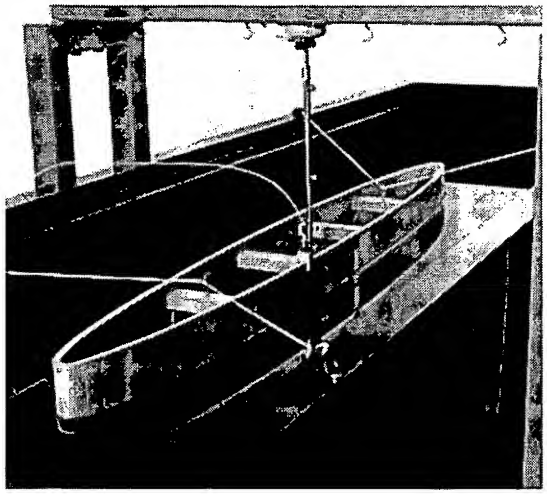
BEAM-TO-LENGTH RATIO

NAVAL ARCHITECTURE

armfield

NA4 & NA8 (Issue 5)

Ships Vibrations Test Model Ships Stability Apparatus



NA48 Datasheet

The NA4-10 Ships Vibrations Test Model apparatus is designed to enable students to investigate a simple model hull form for resonance phenomena. It may be used in conjunction with the optional fresh water tank or any suitable tank which may be available. Many of the principal phenomena associated with ship resonant vibration are clearly demonstrated.

At a more advanced level the distribution of mass and second moment of area may be calculated and using a Young's Modulus value for the material of the ship shaped beam, the natural frequencies may be estimated by a simple tabular method or other means and compared with the measured value.

Demonstration Capabilities

In air to:-

> Investigate model characteristics of a simple suspended ship shaped box girder
> Produce a resonance curve .Produce the amplitude curve of a 2-node and 3-node flexural model
> Illustrate the influence of mass and its distribution upon natural flexural frequencies

In water to:-

> Measure the influence of added virtual mass on natural frequency
> Illustrate the effect of the addition and distribution of sand ballast on the natural frequency
> Calculate the added virtual mass by different methods and compare with experimentally measured influence using a Schlick-type formula

Ordering Specification

- Apparatus designed to enable students to investigate a simple model hull form for resonance phenomena.
- The apparatus comprises an experimental model hull, a rigid supporting frame, a vibrator (complete with signal generator and power amplifier) and an optional Flotation Tank (order code NA4-11).
- The experimental model is flat bottomed, wall-sided and open topped. It has an elliptical plan form.
  - Length to beam ratio 8:1
  - Length to depth ratio of 12:1
- Used to demonstrate the principle phenomena associated with ship resonant vibration.
- Can be used to investigate resonance phenomena in both air and water.

Optional Accessory

NA4-11 Flotation Tank for NA4-10

Services Required

Elecrical supply:
NA4-10-A: 220V-240V/1PH/50Hz
NA4-10-B: 120V/1PH/60Hz

Free water surface, if NA4-11 Fresh Water Tank not ordered

Overall Dimensions

NA4-10 only
Height: 1.44m
Width: 2.66m
Depth: 1.17m

Shipping Specification

NA4-10 only
Volume: 1.0m^3
Gross weight: 120Kg

The NA8-10 Ships Stability Apparatus is designed for the study of ship hydrostatics and stability. A comprehensive manual provides hydrostatic stability and other data for ship models. Also information for a course of practical study in ship hydrostatics, flooding and stability and describes a number of experiments which are useful to students. Exercises are conducted on a 1 /70 scale model of a vessel of 28000 tonnes ship mass. Rolling, righting and the effects of flooding various compartments may be studied.

Optional alternative ships models are also available for study.

Demonstration Capabilities

> Inclining experiment
> Influence of a free surface
> Influence of a suspended mass, especially with the crane ship model
> Effect of flooding various compartments
> Rolling experiments

Ordering Specification

- Apparatus designed to enable students to study ship hydrostatics and stability.
- Supply includes a water tank, a floating ship model, a dynamometer and a clinometer.
- The model supplied is a 1/70 scale model of a 28000 tonne general cargo vessel.
  - It includes a number of transverse watertight bulkheads in representation positions.
  - The compartments are fitted with individual flooding valves.
  - The model is constructed of glass reinforced plastic (GRP).
  - Models of other ships are available as optional accessories.
- The dynamometer measures the righting moment of the model.
  - It holds the model at any angle of heel within the range, with the model either free to trim or with heeling axis kept horizontal.

- It exerts no vertical force on the model.
- It is floor standing, with castors and is supplied complete with counterweights.

- Battery powered clinometer measures the inclination of the model, over the range of 0 to 45 degrees.

Optional Accessories

NA8-14 Trawler Model: A 1 /25 scale model of an ocean going trawler of 850 tonnes ship mass constructed in glass reinforced plastic (GRP). The hull is fitted with a number of transverse watertight bulkheads in their correct positions. Flooding valves are fitted.

NA8-15 Crane Ship Model: A 1 /50 scale model of a crane ship typical of those used in off-shore industries. The hull is ballasted and fitted with a moveable derrick supplied with a number of masses for suspension.

NA8-16 Rectangular Barge Model: Moulded in GRP, dimensions 2200x400x250mm and fitted with internal bulkheads, supplied with the necessary ballast and trimming weights.

Overall Dimensions

NA8-10 only

Height: 2.17m
Width: 2.66m
Depth: 1.95m

Shipping Specification

NA8-10 only

Volume: 3.5m^3
Gross weight: 600Kg

We reserve the right to amend these specifications without prior notice

HISTORY AND ARCHAEOLOGY OF THE SHIP - STUDENT SEMINAR REPORTS 2000

RETURN TO SEMINAR LIST Previous Reports

REP016 Hatshepsut's Punt Expedition Angela Speight

The picture shows part of the painted relief of the punt expedition from Queen Hapshepsuts temple at Deir-el-Bahari . Dated to 1479-1457 BC.

There are numerous references to contact with the land of punt (puwt) located south of Egypt and was reached by the Egyptians via the red sea. The reliefs are important s they are the most valuable source of information on Egyptian seagoing trading Galley's.

There are a possible 5 vessels in the expedition, Only 2 are show here. This is relief 3 of the sequence. Depicting the ship loading with commodities in punt before leaving for home. Some idea as to what is displayed being carried on the deck is given in the hieroglyphic above. Goods include Myrrh trees, myrrh resin, ebony, pure ivory Khesyt wood, apes , monkeys and Dogs. The cargo is displayed on the ships deck however this is unlikely to be the way the cargo was carried and is the artist was of giving us a impression of the load.

The ships are clearly galleys as can be seen from the other pictures in the sequence , no oars are displayed here as the ship is docked. The ship however is also capable of sailing. And has a mast with square sail. Here both boats are shown with their sail furled. The boat's as well as having yards also have booms. The yard has ben lowered to the boom to furl the sail that the other way around that is usual practice.

The yards are mad from two pieces of wood fissure together . The mast is supported by for stays and backstays but there are no shrouds instead there is a tension cable wound around the bottom of mast .

The boats have clean lines indicating refinement and development in ship building. The stem post is straight, but the stern still curves and ends in a decorative lotus blossom, a remnant of the days of reed boats. Two large stirring oars are attached at the stern having tillers and with a loom.

There are 15 rowing positions to a ship from the interscalminum the over all length has been worked out to be around 60-70 ft. However the long slender hull poses a design weakness, that is countered by a large hogging truss on each ship, carried on four massive crutches with cables wound around the stem and the stern.

Finally the sails are shown positioned length ways along the ship this would be unlikely to be the sailing position as the ship would more than likely capsize.

REP016 Hatshepsut's Punt Expedition Walter Theaker

Hatshepsut's expedition to punt as depicted in her mortuary sanctuary Deir el Bahri.

Our most valuable source of information on Egyptian seagoing trading galley's in the Late Bronze Age.

The scene illustrates the voyage to and from Punt of a fleet of possibly five vessels, although the exact number of ships that took part is impossible to determine. The naval part of the expedition is depicted in two registers which contain four temporal movements. The action flows clockwise from bottom right, where the ships leave for punt, to lower left, where the ships unload their trade goods on to a ship's boat to be ferried ashore. In the upper right, the ships are in the process of being loaded with a variety of commodities of great value to the Egyptians. Above this scene is the following inscription. The loading of the ships very heavily with marvels of the country of Punt; all goodly fragrant woods of god's-land, heaps of myrrh-resin, with fresh myrrh trees, with ebony, and pure ivory, with green gold of Emu, with cinnamon wood Khesyt wood, with ihmut-incense, eye-cosmetics, with apes, monkeys, dogs, and with skins of the southern panther, with natives and their children. Never was brought the like of this for any king who had been since the beginning.

Finally, at upper right, the ships depart and return to Egypt. The ships are depicted with fifteen rowers to a side, the human figures seem to be drawn to a scale somewhat greater than that of the ships themselves, therefore it is possible that the number of the rowers portrayed may br less than the actual number employed.

The 3500-year-old diver's guide to the marine life of the Red sea is the best indication that the ships in Hatshepsut's relief are based on illustrations prepared by one or more artists who accompanied the expedition and recorded the marine life caught by the crew. (for eating)

the hogging truss on each ship is carried over four massive crutches. It is not clear how the truss was attached to the hull, although this may have been accomplished by means of through-beams. Cables were wrapped around the bow and stern where the hogging-truss was attached, to prevent the planking from buckling under the enormous strain of the hogging-truss.

These ships, shown in profile, appear relatively slender, and certainly the hulls bear a striking similarity of types off hull that is known from Theban tomb paintings, as well as from models from the tombs of Amenhotep II and Tutankhamun.

These models have a long, nearly horizontal, stem and sternposts and a beam\ length ratio of about 1:5. The models do differ, however, in several details from Hatshepsut's Punt Ships: they have a central cabin, their posts are finished in a different manner and they lack hogging trusses.

A terracota Model uncovered at Byblos apparently patterned after this same type of Egyptian ship, indicates that it was indeed used for blue-water sailing. The Lebanese model clearly shows a massive Keel-like structure inside its hull which projects outward at bow and stern, but becomes flush with the hull amidships, in the same manner as in the wooden models from the tombs of Amenhotep II and Tutankhamun. This characteristic has been attributed to the desire to have the model stand upright on a flat surface (Landstr"m 1970, P:107) It is clear that this is not the case because this feature also appears on Hatshepsut's Punt Ships which are painted in relief. This raises the remarkable likelihood that this feature may indicate that Hatshepsut's ships had a developing' form of Proto-keel. If so, the Egyptians may have continued using a hogging truss on their seagoing ships because they did not sufficiently understand the Keel's use nor appreciated its advantages. According to Wachsmann, this type of keel that projects upward into the hull amidships, seems to have been the normal keel form on seagoing Late Bronze Age ships. A keel protruding beneath the hull prevents slippage to leeward, Wachsmann, suggests that the Bronze Age mariners may not have been concerned with this aspect of the keel if, with their primitive boom-footed rig, they did not set sail unless the wind came from well abaft of the beam. Perhaps for the same reason these ships did not have shrouds to support the mast and sail laterally, but rather depended on tensioned cables which were wound around the bottom of the mast.(Wachsmann 1990). Thus, the Bronze Age oarsmen were likely to pull at their oars more often, or the ships stayed

longer at anchor, waiting for following winds. Assuming an interscalmium of 1metre (3.3feet), for each of the fifteen oarsmen and an additional 3-4 metres at either end, these ships would have been about 23 metres (75 feet) in length. That is, assuming the number of rowers is not just an artistic convention.

The rowing of Hatshepsut's Punt ships has been the subject of some debate.

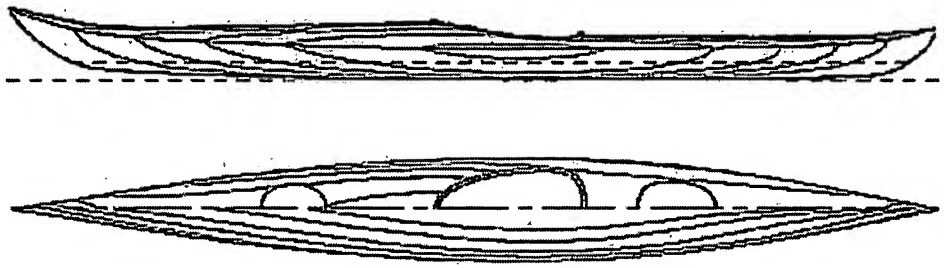
Ballard argues the vessels were rowed with long sweeps because the oarsmen seem to be standing up to pull their oars. He believes that the men stood near the ship's longitudinal median line, but underwent foreshortening at the hands of the Egyptian artists.

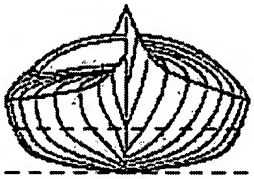
Four rowing positions are depicted at Deir el Bahri in the scenes of the voyage to Punt, a procession on the Nile and the moving of Hatshepsuts's obelisk barge. Jarret-Bell used these four positions to reconstruct a single stroke. the rowers lean forward in a sitting position at the beginning of the stroke (A) with oars at a 40-degree angle from the vertical, for the following stage (B), they continue to site and lean forward, but their oars are now at an angle of 28 degrees, then in the third phase (C), they stand up and lean backwards with the oars at a 15- degree angle, finally in the last phase (D), they stand erect, with the inboard arm pressed against the chest and the oar at a 9- degree angle. Jarret-Bell concluded that the oars must have been turned sideways on the return stroke and never left the water, resulting in a short and choppy stroke. The advantage of this type of stroke, however, is that the men would have been positioned near the side of the hull, giving more room for storing the cargo on deck, as seems to have been the case. Landstrom considers the position of the oarsmen to be the result of Egyptian artistic convention. As he points out Egyptian models complete with rowers depict the oars lifted high above the water, possibly indicating that rowing was carried out in the normal manner. Egyptian rowers used two types of chaffing gear, which had a square patch of leather for the seat, surrounded by a leather net. This garment could be worn by its self, or over a linen garment. (See Conway's The Age of the Galley 1995.)

Storm SLT (super light)
Technical specs...

Wood strip touring kayak for smaller size paddlers.
The smallest One Ocean Kayaks model

Site Menu
Home
Kayak Building
Kayaks
Product Info
Ordering
About
Email





Storm SLT description | MATERIALS
Largest displacement version of this kayak: **Storm**
Second larger version of this kayak: **StormLT**

Property	English	Units	Metric	Units	Comments
Length Overall	15.5	ft	4,724	m	length from bow to stern as designed
Beam Overall	21.5	in	54,61	cm	widest part of kayak
Draft	3.66	in	9,296	cm	baseline to Designed Water Line (DWL)
Volumetric Properties					
Displacement	180	lb	81,8	kg	at DWL
Volume	2,81	ft^3	79,62	liters	displacement in cubic feet or liters of sea water
Wetted Surface	16.87	ft^2	1,567	m^2	underwater surface area to DWL
LCB	7.393	ft	2,253	m	longitudinal center of buoyancy from x=0
LCB % LWL	52.6	%	52,6	%	LCB as a percetage of waterline length from x=0
VCB	2.29	in	5,83	cm	vertical center of buoyancy from baseline
Waterplane Properties					
Waterplane area	14.402	ft^2	1,338	m^2	at DWL

LCF	7.274	ft	2,217	m	longitudinal center of flotation from x=0
LCF % LWL	51.8	%	51,8	%	LCF as a percetage of waterline length from x=0
LWL	14.031	ft	4,276	m	length of waterline; same as DWL
BWL	19.44	in	49,38	cm	beam of waterline
Sinkage	76.8	lb/in	13,74	kg/cm	pounds displaced per one inch of sinkage
Form Coefficients (no units, same for metric)					
Cb	0.405				block
Cm	0.764				midship
Cp	0.53				prismatic
Cwp	0.633				waterplane
Area/Displacement	8.46				Area / Displacement ratio [ft^2/(ft^3)^2/3]
Length / Beam	8.65				Length / Beam ratio [LWL / BWL]
Miscellaneous					
Area of cockpit	2.9	ft^2	0,269	m^2	for cockpit template in plans (red)
Circumference	6.76	ft	2,06	m	cockpit
Depth in front	11 1/2	in	29,2	cm	inside cockpit
Depth in rear	8 7/8	in	22,5	cm	inside cockpit
Deck area	20	ft^2	1,858	m^2	includes cockpit area
Hull area	26.57	ft^2	2,468	m^2	
Kayaker Fit & Loading	Small size paddlers 130 lb min. -> **140 lb ideal** -> 165 lb max. (59 -> 63,7 -> 75kg) ***Recommended max. load:*** 200lb (91 kg) ***Paddler height:*** under 5' 8" feet (173cm)				
x=0 the start of waterline (DWL) at bow					

All **English units** (ft / in) in the plans have a **Metric** (m / cm) eqivalent !

Material

Wood strips - assumes bead & cove strips

Unit converter

Coverage + 'fudge factor' for waste	Surface area (ft^2) (m^2)	Total length of 3/4" strips (ft) (m)	Number of 3/4"x 16ft strips	Total length of 5/8" strips (ft) (m)	Number o 5/8"x 16ft strips
Total area of kayak (+ cockpit)	46.5 (4,32)	894 (272)	56	1118 (341)	70
Total area + 5%	48.9 (4,54)	939 (286)	59	1174 (358)	73

Total area + 10%	51.2 (4,75)	984 (299)	61	1230 (375)	77

Notes & Tips:

- 3/4" strip width = 1,9 cm
- 5/8" strip width = 1,58 cm
- 16 feet = 4,87 m
- The accuracy of figures in the table is within (+ -) few feet
- For custom calculation, see the Wood strip Calculator
- The coverage based on the "+ 10%" is most recommended
- Estimate wood for deck inlays as a percentage of the deck surface area
- Ideal strip length is between 10 - 16 feet

Fiberglass coverage

Coverage of fiberglass (plain weave e-glass)	yards (yd)	feet (ft)	meters (m)	How to estimate
Deck - 4 oz. e-glass	11.3		10,4	two times the kayak length + 1 yard (1m)
Hull - 6 oz. e-glass	11.3		10,4	two times the kayak length + 1 yard (1m)
2" wide glass tape		71	21,6	four times the kayak length + 9 ft (3m)

Notes & Tips:

- Minimum width of fabric is 38" - will no allow for full hull abrasion patch
- Order 50" width of the 4oz. glass to get the extra hull abrasion patch material
- If 50" fabric is not available, order one 'waterline length - LWL' of additional cloth (any weight)
- Round figures to the nearest higher number when ordering fabric
- The 6oz. glass can always replace the 4oz.
- See different types of reinforcement fabrics
- Glass tape is sold in 'feet' and cloth in yards (in the US)
- Glass tape is used to bond the kayak shells and for additional stem reinforcement

Epoxy

Minimum total volume of epoxy mix (resin + hardener): **2 - 2.5 gallons**

Notes & Tips:

- Usage may vary (+-) 0.5 gallon as a result of the thickness of lay-up, fillet size, unusec batches, spills, bad (unmixed) batches, care in application (overapplication), additiona composite components such as coamings, hatch seals, rudders etc...
- If epoxy is sold by weight, the density of epoxy is very close to water ($1dm^3$ = 1 liter = 1kg)
- 1 gallon = 3.8 liters
- Learn about epoxy

Back to **Kayak Designs** | **Plans** | **Kayak comparison page**

Home	Kayak Designs	Kayak Shop	Materials	Kayak Gallery	About us
Building Manual	Plans	Sandwich Core	Wood Kayak	Order	E-mail
Epoxy Test	Abrasion Cloth	Rudder	Resources	Choosing Kayak	Guestbook

If you notice any problems with the site (i.e. error links, missing images) please, **let me know**. Thanks

Mail:
Vaclav Stejskal
10 Coolidge Hill Rd.
Watertown, MA. 02472
USA
Tel: 617-926-2717

E-mail

Last page update: 3 January 2005

Home
The 210 Boat
Race Results
Race Schedule
News
Links
Fleets
Boats For Sale
Officers
Photos
Rules/Regs

Is The 210 for Yo

With it's 5:1 length-to-beam ratio, low displacement to length ratio, hard chines, and st is state-of-the-art for today's racing machines, there is something just right about this b their value for year after year.

EASY TEST TO FIND OUT:

1. Do you love to go fast ?

2. Do you crave one-design **competition** ?

3. Do you **dream** of a boat that achieves high marks in both performance and comfort so That racing won't be such an ordeal, and sailing for pleasure will be really rewarding ?

4. Want a neat daysailer?

YES? THEN READ ON.

Whenever a one-design lasts and continues to perform smartly enough to attract a savvy following, there has to be good reason. With the 210, it's simple: C. Raymond Hunt's pace-setting 30' design is as slippery today as it was off that inspired man's drawing table.

With it's 5:1 length-to-beam ratio, low displacement to length ratio, hard chines, and that is state-of-the-art for today's racing machines, there is something just right abou maintain their value for year after year.

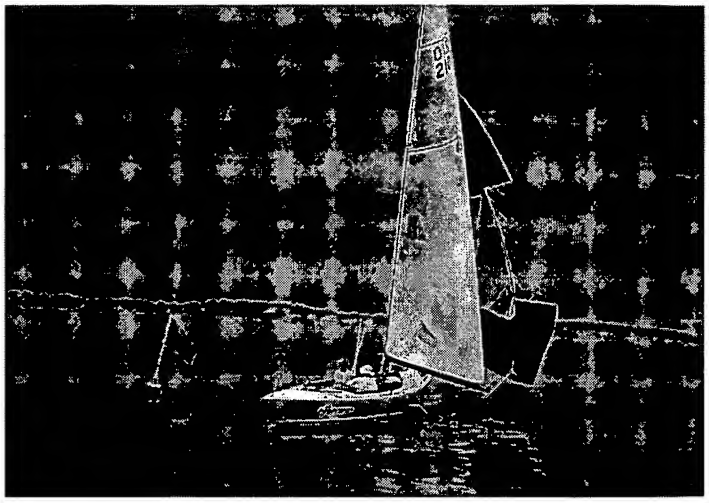
length 29' 10"; beam 5' 10"; draft 3' 10";
displacement 2300 pounds; ballast 1200; sail area main & jib 3
spinnaker 400 sq ft; crew number 3; no hiking assists.

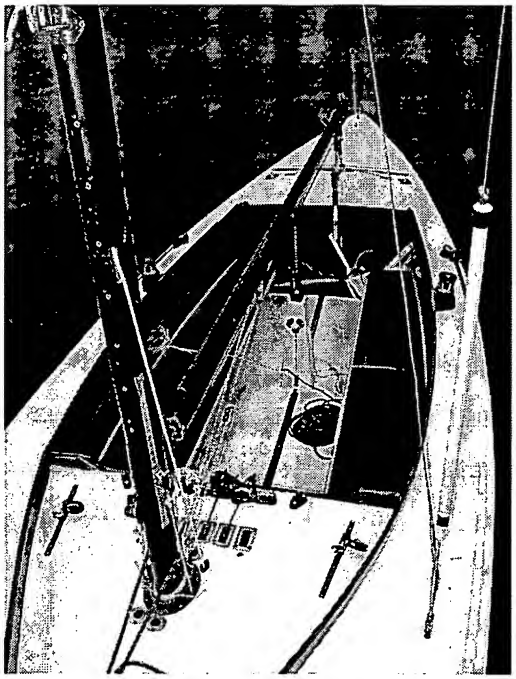
The 210 is sleek, exciting, and offers great fleet competition. The boat was designed to me Massachusetts Bay, and it's the only racing class that has several active fleets in the Bay: Bc There's a sixth fleet in nearby Falmouth. There are two fleets in Michigan- Muskegon and Gr many boats in Maine, Gloucester and Marblehead, and some on the Chesapeake Bay.

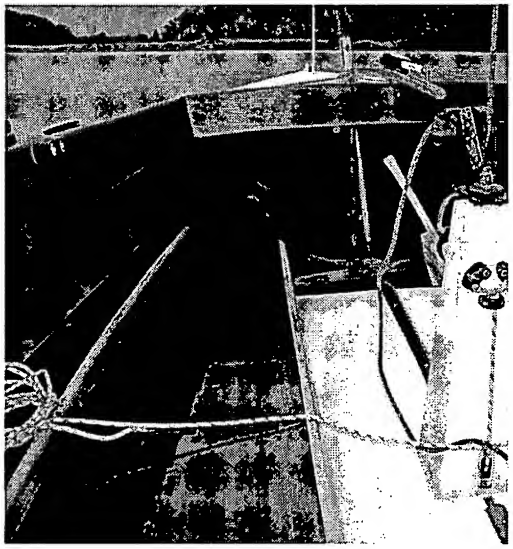
The Sullivan Trophy Regatta at the end of June brings the fleets together for the first time. weeks throughout the summer augment the busy fleet calendars. All the action builds to th August, where the competition is keen.

The 210 shows its heels to most boats in its category, even the full-out racing machines tha high pain thresholds. And leaving 40-footers in it's wake is one of the 210's embarrassing hat

Day Sailing?
As this wonder sails with quiet confidence into the 21st Century, it remains a challenging ra







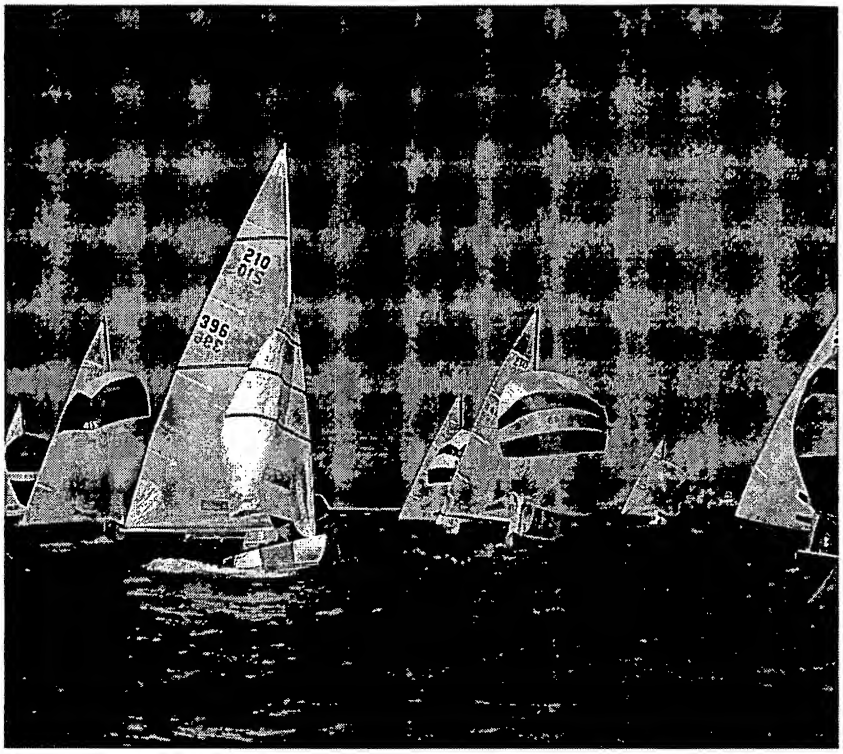
IF SAILING MEANS AS MUCH TO YOU AS RACING, THE 210 WILL NEVER LET YOU DOWN.

The late Ray Hunt (a man of few words) on how the 210 design came about: *"Several peopl*
larger boat than the 110 based on the same principals: racing performance and a safe

THE 210 PERFORMS.
There's usually a Catch-22 attached to boats that perform: discomfort. The owners of 210s l
because it doesn't apply. Racing, 210 sailors sit on the rail with their feet on the thwarts wh

comfortable bench seats, that can sit 6, with wide coamings behind their shoulders.

Most important of all, the 210 provides comfort without sacrificing an iota of performance.



Performance and comfort is a powerful combination. It puts the 210 in a league of its own.

The 210 construction has evolved over the years, but adhere to the one-design specificatior generations have won the National Championship that is sailed in the mid-West and the Eas certificates are carefully maintained by an active rules and measurement committee. The g to discuss ways to keep the class modern while maintaining its basic integrity. The hull and association and builders are carefully monitored. Old or new boats can be equally fast and

To find out more about the boat, new and used, contact the Class Vice President - Eric Crev E-mail to EricCrews@cs.com

How to Set Up the Boat Controls and Layouts by National Champion

How to Tune the Boat How to tune for racing by National Champion

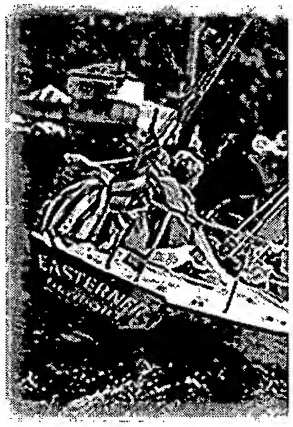
The designer:

History of C. Raymond Hunt Associates, Inc

C. Raymond Hunt
1908-1978

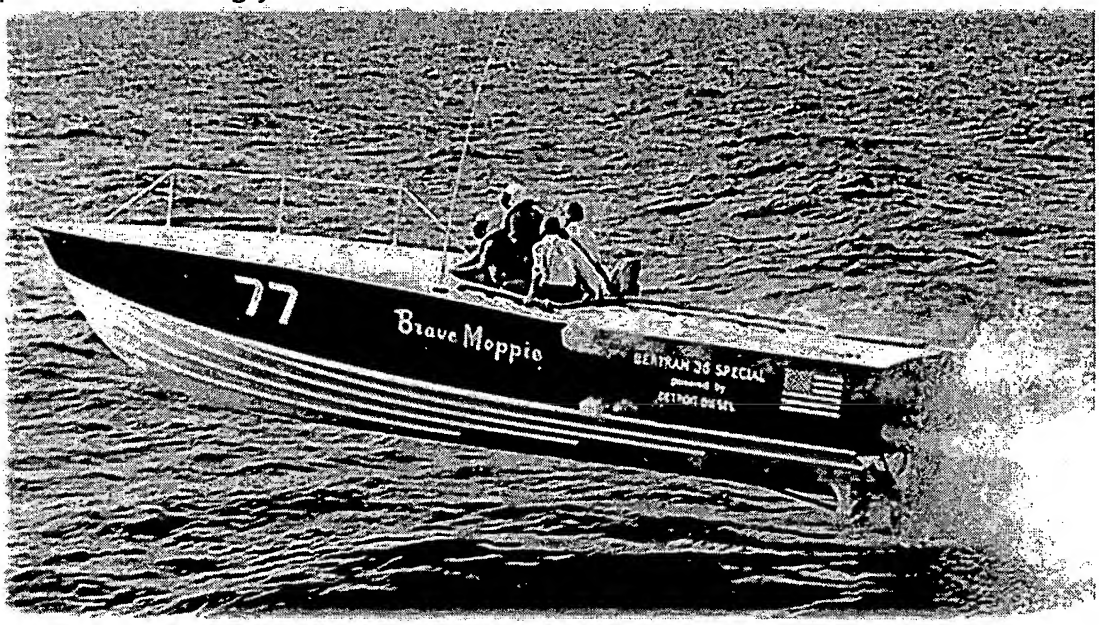
Naval Architect: **210**, 110, 5.5 Meter,
Concordia Yawl, 12 Meter, Boston Whaler.

C. Raymond Hunt was an internationally known and respected helmsman anc Sears Cup twice, the first time when he was only fifteen years old. He sailed and was a member of the afterguard of the J-boat "Yankee". He had an unca know how to move a boat through the water fast. His intuitive skills enabled most innovative designers of his time. Although he had no formal education developed radically new designs, which made a strong contribution to the de



In the late 30's Hunt designed the 110, one of the first boats made of marine plywood. The 110 was a flat-bottomed, double-ended, 24-ft. splinter that was the first of the semi-planing hulls. It was light, easy to care for and inexpensive. Ray designed the Concordia Yawls in 1939. It seems safe to say that to this day Concordias have given more pleasure to more owners and won more important races than any other boat of similar type. After the war, the 110 was followed by the still-popular, larger 210. His 5.5-Meter "Minotaur" captured the Olympic gold in Naples. In 1963, Ray Hunt sailed his "Chaje II" to the 5,5 World Championships. He developed the 13-ft. Boston Whaler in the mid fifties. Thousands have been built and the design has changed little through the yea contribution to powerboats, however, was the development of the deep-vee

A quiet introspective man, C. Raymond Hunt stood alone in the world of yac internationally known and respected helmsman, but he was unmatched in hi power and sailing yachts.



C. Raymond Hunt Associates, Inc.

69 Long Wharf
Boston, MA 02110-3618 USA
Tel: 617-742-5669
Fax: 617-742-6354
Email: info@crhunt.com

Home